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B2E

(54) Surface covering product

(57) A surface covering product which comprises a substrate material, an impervious coating upon said material, and raised elements selectively printed upon said coating, which raised elements comprise or are derived from a thixotropic plastic containing particles of solid material. Such a product creates embossed-in-register features without the need for chemical or mechanical embossing.

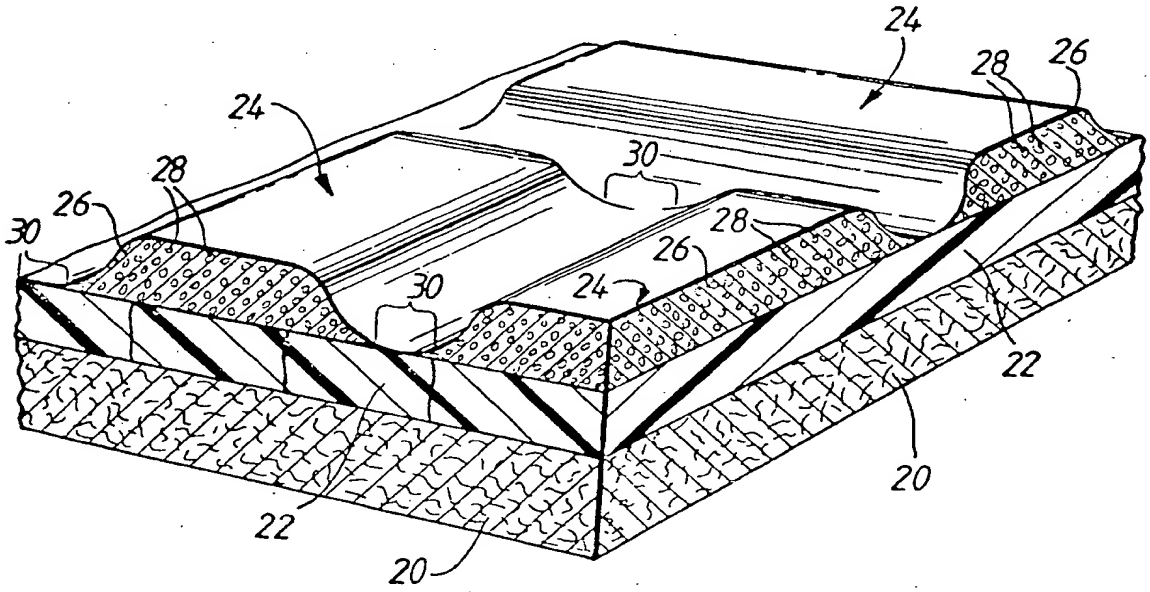

FIG.1.

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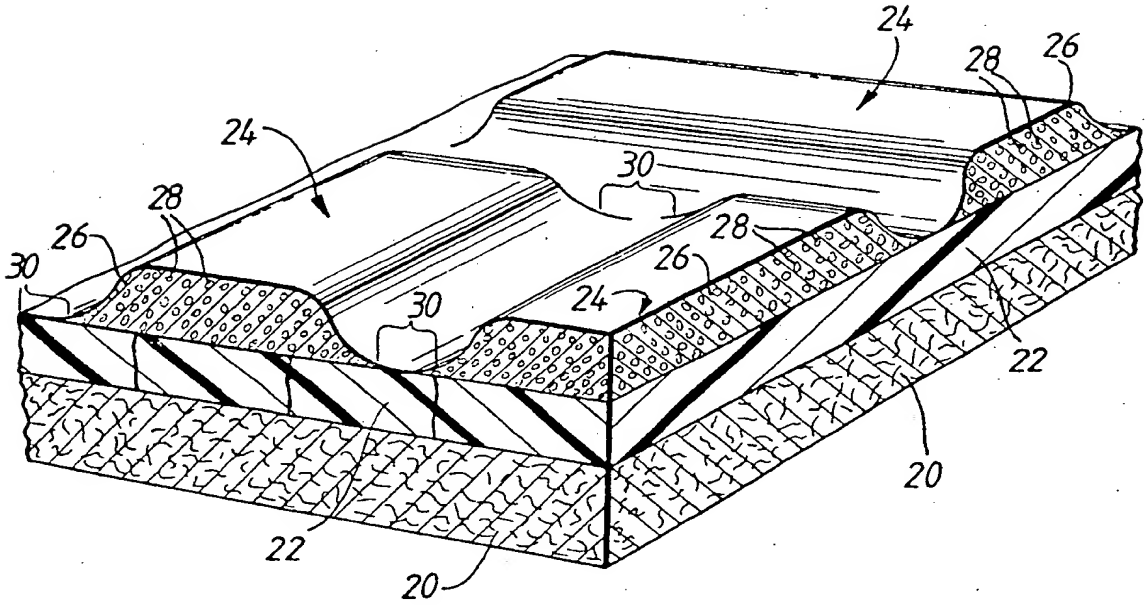

FIG.1.

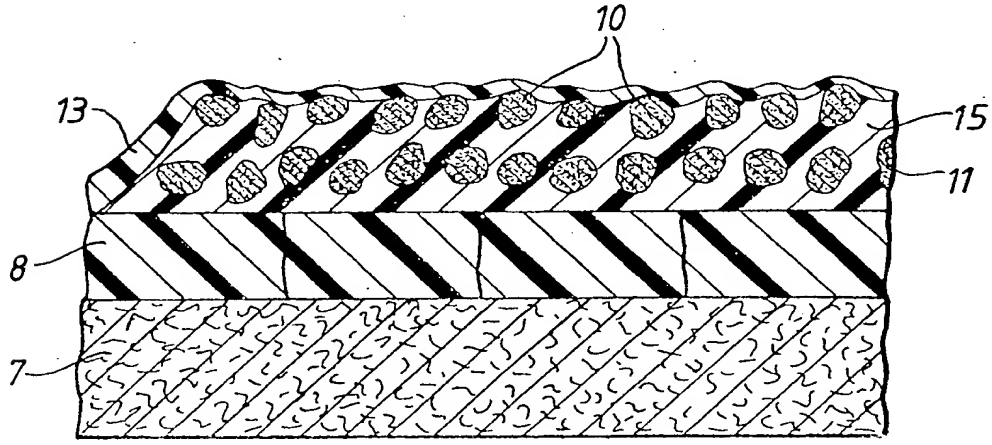

FIG.2.

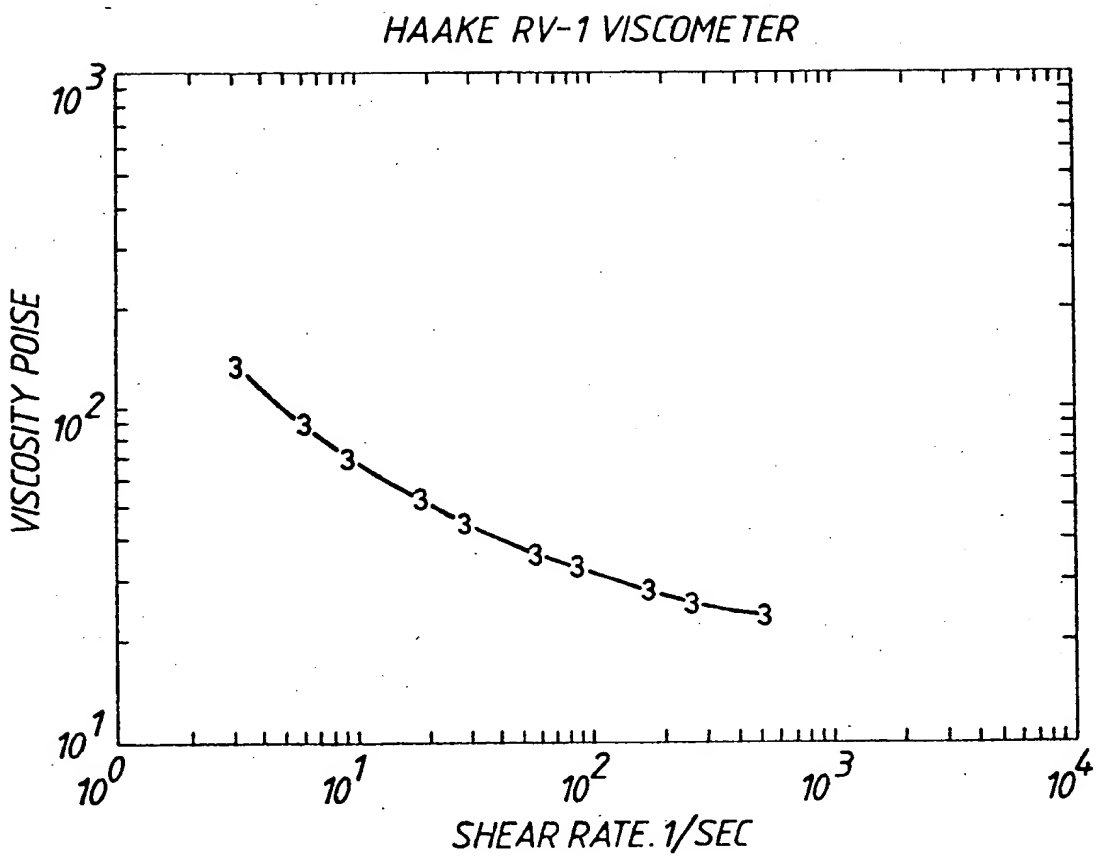
HAAKE RV-1 VISCOMETER
VISCOSITY POISE
10^3
10^2
10^1
3
3
3
3
3
3
3
3
3
10^0
10^1
10^2
10^3
10^4
SHEAR RATE. 1/SEC

FIG. 3.

2200578

"Surface Covering Product"

The present invention relates to a surface covering product. More especially, the invention relates to a surface covering product comprising a substrate having an impervious coating thereon, with elements of a plastic material containing solid materials selectively disposed upon said coating.

It has been proposed to provide surface covering products having disposed thereon raised elements which contain particles of solid material. For example, in U.S. Patent No. 4,348,477 there are described non-skid plastic flooring structures in which inorganic particles in a substantially abutting relationship are embedded in a cured plastic matrix. Since the matrix, which is normally an adhesive, may be printed in a selective pattern, the raised elements give the appearance of an embossed-in-register flooring material. Because such particles are applied to the adhesive surface of the matrix, however, particles in this manner typically do not penetrate uniformly throughout the plastic matrix. In addition, the number of particles is substantially limited and the particles must be covered over with a thin coating of a clear plastic material to bond them securely to the material. In coating the particles with the thin film, the underlying coating, interstitial to the raised elements, is coated also.

In such a product, however, the raised elements,

while they may have some decorative value, would have interfered with and obscured any underlying decoration present. Further, such raised elements, while useful for increasing wear resistance, create additional difficulties in the maintenance of the surfaces, and additional care must be taken in the maintenance of flooring employing such devices.

It is an object of the present invention to provide a surface covering in which a greater number of solid particles may be positioned in raised elements on the surface product and in which the solid particles present may be more evenly distributed throughout these raised elements.

It is a still further object of the present invention to provide a surface covering product with selectively placed raised elements to create embossed-in-register features without the need for chemical or mechanical embossing.

It is a still further object of the present invention to provide a surface covering product having raised elements without the need to provide an over coating of clear plastic material.

According to one embodiment of the present invention, there is provided a surface covering product comprising a substrate, more especially a substrate material with an impervious coating thereon, and elements selectively disposed upon said substrate,

and more especially upon said coating, which elements comprise a plastic matrix containing particles of solid material, which matrix is derivable from a thixotropic polymeric composition.

Accordingly to another embodiment of the present invention, there is provided a method for the manufacture of a surface covering product which method comprises providing a substrate, more especially providing an impervious coating upon a substrate material, selectively positioning on said substrate raised elements of a thixotropic polymeric composition containing particles of solid material, and fusing the raised elements to the substrate to provide a covering product of unitary construction.

One embodiment of a product constructed in accordance with the invention and a method for its manufacture will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 shows a cross-sectional view of the product of the present invention;

Figure 2 shows a cross-sectional view of the product of the prior art as shown in U.S. Patent No. 4,348,477; and

Figure 3 is a graph illustrating the variation of viscosity with shear rate for a polymeric composition suitable for use in the invention.

Raised surface elements, and particularly raised surface elements containing solid particles, have long been employed as a way of increasing the slip resistance or abrasion resistance of surface coverings. In the present invention, a product having such raised surface elements of a thicker aspect may be provided in a process which does not require coating of the elements and surrounding areas.

In the prior art, such a construction as that shown in Figure 2 has been produced by preparing a substrate 7 with a suitable coating 8 and selectively applying an adhesive material 15, such as an ungelled plastisol. Solid particles, such as elements 10 and 11, are then applied uniformly to the coating substrate, but adhere only to the adhesive portions, the remainder being subsequently removed. In order to hold the particles in position, the material is then coated with a uniform layer of clear wear layer material 13.

In one embodiment of the present invention, as illustrated in Figure 1, a substrate 20 is prepared with a suitable impervious coating 22, to which are selectively applied raised elements 24 composed of a thixotropic plastic material 26 containing particles of solid material 28. Since no clear wear layer need be employed to permanently bind the particles as in the prior art, portions of the underlying coating 22,

represented as 30, may if desired be left uncoated in the final product.

Any substrate may be employed in the product and method of the invention, more especially, any of the substrates normally employed in the field. A suitable substrate may be the plastisol-saturated glass mat described in Example 1 below, or a wet-laid felted sheet, also common in the surface covering art, could be employed with equal advantage. Further, either substrate could be back-coated with a foamed or compact coating to form an interliner product.

The broad applicability of the invention makes it possible to make the choice from available substrates on the basis of manufacturing convenience or the physical property requirements of the end product.

Once a substrate material is chosen, it is desirably coated with a suitable impervious material. While it would be possible to apply the raised plastic elements directly to a wet-laid felt, without the application of an impervious layer to protect the interstitial felt, the product would have limited commercial value. A decorative coating would normally be applied even if the final product were to be wear layered for protection.

If the substrate comprises a glass mat, it should be provided with an impervious coating, usually a plastisol which may or may not be foamable, to

substantially uniform dispersion of solid particles throughout.

Example 2

It is possible to form the product herein with a flat surface.

The product herein is made the same way as the product of Example 1 except that an additional coating is added prior to fusion of the product. After the raised elements are gelled, an overall coating of the impervious coating material above is applied to fill in the depressed areas around the raised elements. When the grey pigment paste is omitted from the impervious coating material described in Example 1, the coating filling in the depressed areas will be transparent and the Example 1 and 2 products will look substantially the same, but the Example 2 product will have a flat upper surface.

What we claim is:

1. A surface covering product comprising

(a) a substrate having a substantially impervious surface and

(b) raised elements disposed on said surface, the elements comprising a polymeric composition containing particles of solid material, said elements having been formed by positioning of elements of a fusible thixotropic polymeric composition on said surface and fusion of said elements to the substrate.

2. A product as claimed in claim 1, wherein the raised elements have a height between 0.003 and 0.08 inches (about 0.075 to 2 mm).

3. A product as claimed in claim 1 or claim 2, wherein the thixotropic composition contains at least one thixotrope selected from a fumed silica, a precipitated silica, a finely powdered organophilic clay, a highly substituted sorbitol, and a calcium-organic complex.

4. A product as claimed in any one of claims 1 to 3, wherein the substrate comprises a substrate material having an impervious coating bonded to at least the surface carrying the raised elements.

5. A surface covering product comprising:

(a) a substrate material,

(b) an impervious coating bonded to at least one surface of said substrate material, and

impregnate the mat and seal over the glass fibers. Such a coating may alternatively be regarded as forming part of the substrate.

The coating may simply be a sealant for a wet-laid felt or be a complex, multilayered, multi-element construction. In all cases in which the surface covering of the invention is to be used as a floor covering the impervious coating should desirably be of wear layer quality, i.e. capable of standing up to normal wear for a floor covering. The product and method of the present invention do not depend on the use of any particular impervious coating. Many coatings and coating methodologies are known to the art which have application to the present invention, including, for example, foamable and non-foamable plastisols, resinous dry blends and stencil lay-ups.

The coating should, however, be impervious to the composition deposited thereon so that the thixotropic material deposited remains on the surface to form a raised element.

Over the impervious coating, raised elements are created advantageously by depositing beads of a pseudoplastic thixotropic liquid containing solid particles. Such deposition may be carried out using any suitable method, many of which are known in the art. Screen printing, though normally employed to deposit inks on porous surfaces, has been employed

with good success and is described in the examples which follow.

The raised elements may be in any shape or pattern, however, geometrics such as repeated patterns of raised circles, squares, diamonds and the like have been demonstrated to be effective visually. It is within the scope of the invention for the elements to be contiguous, e.g. circles may contact adjacent circles tangentially, or diamonds may be in contact at their apices, so that the elements form a single raised area with depressed areas between them. As in other products in this field, the number of such elements per unit area should be complete enough to effectively form a wear surface for the covering. The depressed areas between the raised elements serve both as a decorative element and a structural function, such as channels to carry away liquid spills, and the like. In certain embodiments of the invention, however, the area or areas between the raised elements may be provided with material, of a nature different from that of the raised elements, preferably either at a lesser height than that of the elements or a height equal to that of the elements. The material is advantageously a transparent coating, and is preferably a coating of wear layer quality.

The raised elements may be from 0.003 inch (about 0.075 mm) to 0.08 inch (about 2 mm) above the

underlying substrate material, preferably from 0.015 inch (about 0.38 mm) to 0.045 inch (about 1 mm), and most preferably about 0.03 inch (0.75 mm). Further, the raised elements advantageously cover from 30% to 80% of the total surface area in the final product in order to provide an effective wear surface, with the exact preferred percentage being a function of the geometry of the raised elements.

The present invention depends largely on an interaction between an impervious coated substrate and the rheological characteristics of the plastic material applied. Using, for example, a rotary screen, a pseudoplastic thixotropic material may be deposited on the substrate in thicknesses exceeding that of normal printing inks. Because of the properties of the material, lateral flow may be controlled or substantially eliminated.

Thixotropic materials are materials that exhibit dual rheological behaviour, that is, they exhibit high viscosity under low shear and low viscosity under high shear.

The incorporation of fumed or precipitated silicas as thixotropic agents, or thixotropes, is preferred although various inorganic and organic materials may also be employed, including such inorganic materials as very fine particle organophilic clays and such organic materials as highly substituted

sorbitols or calcium/organic complexes. Fumed silica, available commercially from the Degussa Company under the trade mark Aerosil 200, has been employed to advantage.

The quantity of such materials added to the resin paste system will determine the thixotropic nature of the resulting system, and its viscosities under various rates of shear. Such properties will to a large extent determine the lateral flow of the plastisol deposited as raised elements on the substrate. The viscosity and shear rate of a thixotropic plastisol material are related and the viscosity of the thixotropic material is measured to ensure the desired lateral flow of the material deposited.

The measurement of viscosity when taken with a Brookfield viscometer should be within the range of from 80 to 160 poise, using a No. 6 spindle at 20 revolutions per minute. Viscosity may be adjusted by varying the amount of plasticizer or other suitable viscosity depressants.

Various resinous materials may be employed as the polymer base of the thixotropic material in the present invention and these include virtually any useful resinous plastisols, polyvinyl chloride resins having been employed with advantage.

To be useful in the practice of the present

invention, sufficient thixotropic material must be present to enable the resin system to remain plastic under shear, losing its pseudoplastic characteristics rapidly when the shear force is removed. A suitable material has pseudoplastic characteristics, as illustrated by the Haake RV-1 Viscometer graph of Figure 3, from which it may be seen that the material investigated, a PVC slurry plastisol, exhibits high viscosity under low shear and low viscosity under high shear.

Although the thixotropic material itself provides a wear surface on the end product, the abrasion properties of such wear surface will typically be greatly improved by the addition of solid, or of further solid, particles. Such particles may be an organic material such, for example, as rubber or a plastic material, such as a vinyl resin, or an inorganic materials such, for example, as silica quartz. These particles may be clear or coated or colored in some way as, for example, are resin-colored sands.

In order to be useful in the present invention, the particles are desirably of suitable dimensions such that they pass through a No. 10 U.S. Standard seive series mesh, a screen with openings of about 2.0 mm, and be retained on a No. 200 mesh screen (U.S. Standard), with openings of about 70 μm. Preferred

results are, however, obtained with particles which pass through a No. 25 mesh screen with openings of about 600 µm and be retained on a No. 50 mesh screen, with openings of about 250 µm. The particles of solid material are advantageously of a MOHS hardness of 7 to 9, and preferably about 7.

The following examples illustrate the invention:

Example 1

A 1,600 ft. (about 500 m) roll of 4 m wide fiber glass mat obtained commercially from the Schuller Company was saturated with 500 grams per square meter of a plastisol of the following composition and gelled in contact with an oil-filled drum preheated to 290-295°F (about 143 to 146°C).

Component	Trade Mark	Source	Parts by Weight
PVC Resin	(Lucovyl PB-1702)	ATO Chemical Products (UK)	65.3
PVC Resin	(Pevikon PE-820)	KemaNord Plastics (UK)	23.9
PVC Resin	(Vinnol C65V)	Wacker (W. Germany)	11.7
Plasticizer	(Hexaplas OPN)	Imperial Chem. Ind. (UK)	5.1
Plasticizer	(Santicizer DP-268)	Monsanto Europe (Belgium)	9.2
Plasticizer	(TXIB)	Eastman Chemical	2.5
Plasticizer	(Cereclor S-45)	Imperial Chem. Ind. (UK)	2.5
Stabilizer	(Ingestab BZ-505)	Ciba-Geigy	1.5

Component	Trade Mark	Source	Parts by Weight
Plasticizer	(ED-6)	Lankro Chemicals Ltd. (UK)	0.8
Filler	Alumina trihydrate	BA Chemicals Ltd. (UK)	21.0
Grey pigment paste			6.5

Following this, the smooth surface of the plastisol-saturated mat was coated with 380 grams per square meter of a plastisol of the following composition and gelled in contact with a second oil-filled drum preheated to 285-290°F (about 140 to 143°C) to form the impervious coating of wear layer quality.

Component	Trade Mark	Source	Parts by Weight
PVC Resin	(Lucovyl PB-1702)	ATO Chemical Products	20.7
PVC Resin	(Pevikon PE-820)	KemaNord Plastics	32.4
PVC Resin	(Vinnol C65V)	Wacker	15.9
Plasticizer	(Hexaplas OPN)	Imperial Chem. Ind.	6.9
Plasticizer	(Santicizer DP-268)	Monsanto Europe	9.0
Plasticizer	(TXIB)	Eastman Chemical	3.4
Plasticizer	(Cereclor S-45)	Imperial Chem. Ind.	3.4
Stabilizer	(Ingestab BZ-505)	Ciba Geigy	2.0
Plasticizer	(ED-6)	Lankro Chemicals Ltd.	1.0
Grey pigment paste			5.3

A particle-containing plastisol of the following composition was then screen printed in a regular geometric pattern onto the surface of the gelled impervious coating.

Component	Trade Mark	Source	Parts by Weight
PVC Resin	(Pevikon PE-820)	KemaNord Plastics	43.1
PVC Resin	(Vinnol C65V)	Wacker	10.8
Plasticizer	(Santicizer DP-268)	Monsanto Europe	11.9
Plasticizer	(Hexaplas OPN)	Imperial Chem. Ind.	2.7
Plasticizer	(TXIB)	Eastman Chemical	10.8
Epoxy Oil		Lankro Chemical	1.6
Stabilizer	(Ingestab BZ-505)	Ciba Geigy	1.1
Fumed Silica	(Aerosil 200)	Degussa Corp.	0.5
Grey pigment paste			2.5

The viscosity of the plastisol with particles set forth above should be between 80 to 160 poise for the desired results. Viscosity may be adjusted if necessary by varying the amounts of TXIB plasticizer.

The printed plastisol was then gelled and fused by passing through a hot air oven maintained at approximately 390°F (about 199°C) for two minutes.

The resulting composite product had regularly-placed raised elements simulating an embossed-in-register design, which elements contained a

(c) raised elements having a thickness between about 0.003 inch and 0.080 inch selectively disposed upon said coating, comprising a thixotropic plastic containing particles of solid material, wherein said thixotropic plastic contains at least one thixotrope chosen from the group consisting of fumed silicas, precipitated silicas, finely powdered organophilic clays, highly substituted sorbatols and calcium/organic complexes.

6. A product as claimed in claim 4 or claim 5, wherein the substrate material is a fiber glass mat.

7. A product as claimed in claim 4 or claim 5, wherein the substrate material is a wet-laid fibrous composite sheet.

8. A product as claimed in any one of claims 1 to 7, wherein the particles of solid material are of a MOHS hardness of 7 to 9.

9. A product as claimed in any one of claims 1 to 8, wherein the particles of solid material are, at least in part, organic.

10. A product as claimed in claim 9, wherein the particles are, at least in part, chips of vinyl resin.

11. A product as claimed in any one of claims 1 to 8, wherein the particles of solid material are, at least in part, inorganic.

12. A product as claimed in claim 11, wherein the particles are, at least in part, silica quartz.

13. A product as claimed in any one of claims 1 to 12, wherein the raised elements are disposed in a regular geometric pattern.

14. A product as claimed in any one of claims 1 to 13, wherein the raised elements are arranged to form a means simulating an embossed-in-register product and the raised elements cover 30% to 80% of the surface area of the surface covering.

15. A product as claimed in any one of claims 1 to 14, wherein the area between the raised elements is filled in.

16. A product as claimed in claim 15, wherein the height of the filled-in area is equal to the height of the raised elements to provide a flat surface sheet.

17. A product as claimed in claim 15 or 16, wherein the material filling the said area is transparent.

18. A product substantially as described in either of the Examples herein.

19. A product substantially as described with reference to and as illustrated by Figure 1 of the accompanying drawings.

20. A method for the preparation of a surface covering product, which method comprises:

(a) providing an impervious coating upon at least one surface of a substrate material,

(b) selectively printing raised elements with a screen printer on said coated substrate, which raised elements comprise a thixotropic plastic containing particles of solid material, said raised elements being spaced apart to provide depressed areas therebetween, said raised elements being preferably from 0.015 to 0.045 inches (about 0.38 to 1 mm) in height, and

(c) fusing the material formed in this manner.

21. Any new or novel feature herein described or any novel or new combination of hereinbefore described features.

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